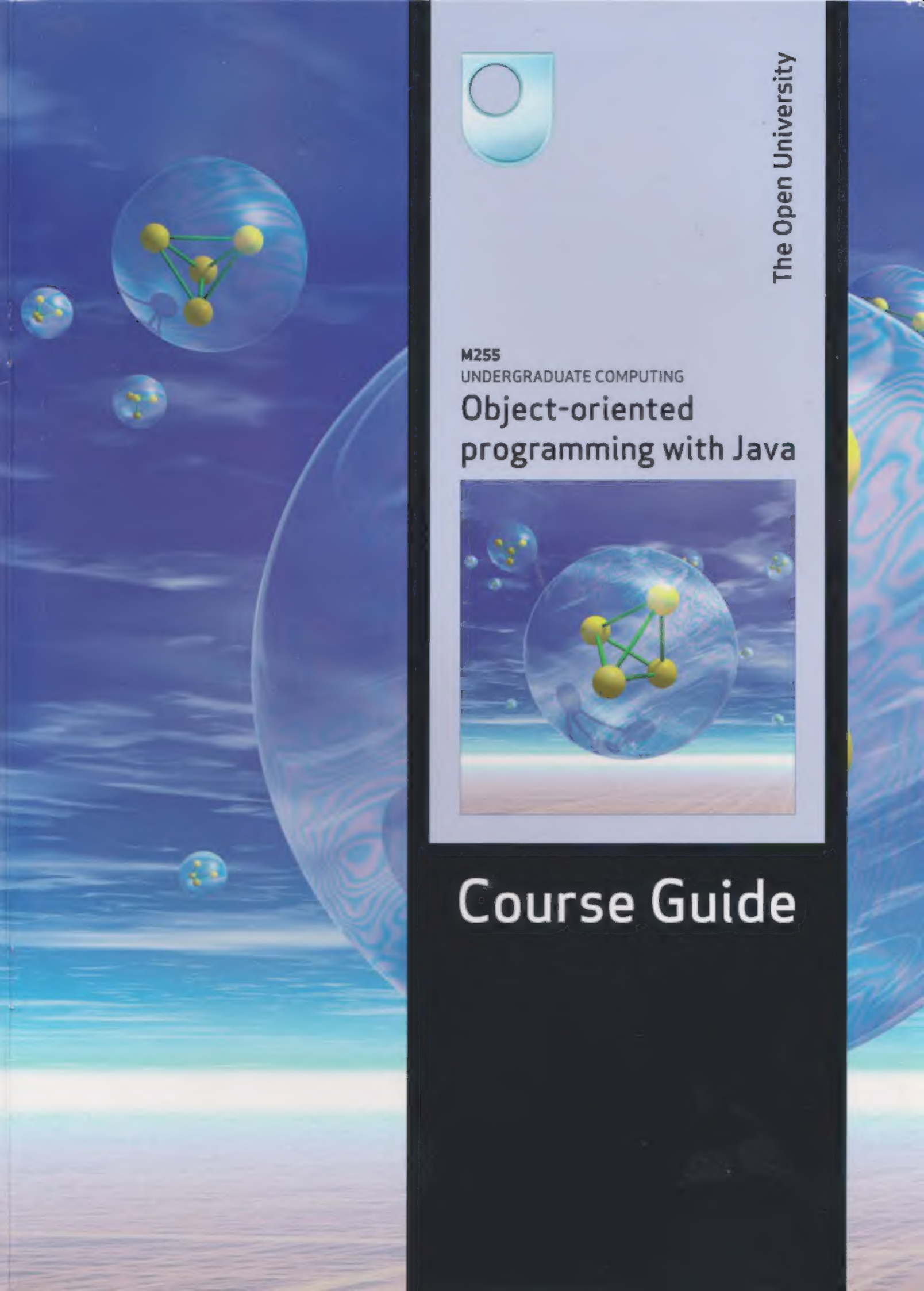

The Open University

M255
UNDERGRADUATE COMPUTING

Object-oriented programming with Java

Course Guide

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This publication forms part of an Open University course M255 *Object-oriented programming with Java*. Details of this and other Open University courses can be obtained from the Student Registration and Enquiry Service, The Open University, PO Box 197, Milton Keynes, MK7 6BJ, United Kingdom: tel. +44 (0)870 333 4340, email general-enquiries@open.ac.uk

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Thanks are due to the Desktop Publishing Unit, Faculty of Mathematics and Computing.

1 Welcome

Welcome to M255 *Object-oriented programming with Java*. We hope that you will find the course interesting and rewarding.

Before you start to study the course units, please take some time to read through this guide and then work through the *Software Guide*.

This *Course Guide* provides you with the information you need at the start of the course, and gives you an overview of the course including its assessment.

The *Software Guide* provides details of preparations you will need to make before you start your studies and how to use the provided software.

Structure of the course

The course is divided into four blocks of text comprising 14 units of study material, and there are four assignments distributed throughout the course. The study units are of unequal length; the *Study Calendar* will indicate the time you will require to study each unit, including the time taken to prepare your answers to the assignments.

The *Study Calendar* also provides details of when you should be studying each unit and the cut-off dates (the latest date by which your tutor must receive your work) for each assignment.

There is an examination at the end of the course.

Course materials

The components of this course are as follows.

- The *Course Guide* (this document).
- The *Software Guide**, which tells you how to install and use the course software.
- The *Study Calendar**, which provides guidance on when you should be studying a particular component of the course or carrying out some task such as completing an assignment.
- Fourteen units of study texts, incorporating study instructions, self-assessment questions (SAQs) with solutions, exercises with solutions, and practical computer-based activities with solutions.
- The software that you will need to study the course. This includes the integrated development environment (IDE) that you will use for the programming activities.
- The M255 website, which is an integral part of the course and includes some course materials which are not available elsewhere.
- The *Glossary*, which provides a description of all the technical and programming terms used in the course.
- The *Index**, which provides references to the main topics in the course.
- TMAs* (tutor-marked assignments). These are pieces of work that you need to complete as part of the course assessment. Your tutor will mark these assignments and return them to you with some feedback to guide your study. The assignments are used as a medium for teaching, together with tutorials and day schools; however, the TMAs provide individually personalised teaching points.

- *Specimen Examination Paper* and *Solutions** (SEP and SSEP). At the end of the course there will be a three-hour examination. To help you in your preparation for this, you are provided with a specimen exam paper, which follows the same format, and has the same style and level of questions, as the paper itself. You are also provided with model solutions to this specimen paper.
- The *Course News*. We try our best to ensure that the materials we produce are free of errors. In spite of the efforts of the course team, editors and readers, we might have overlooked a few errors such as spelling or typographical errors, which do not affect the teaching. Just occasionally it may turn out that something we thought we had explained adequately needs amplification. We use the *Course News* to address such problems and communicate directly with students about other important course information. You will be provided with a printed *Course News* item in your first mailing, and after that you should check the website for news items at least once a week.

* Items marked with an asterisk will be available from the course website only. Other items will be provided as hard copy (print) and/or on CD-ROM.

2 Before you start

Please read the rest of this guide carefully to ensure that you are properly prepared for study. Remember that this course will take considerable time and effort on your part.

Prerequisite knowledge

You should be familiar with the basic components and working of a computer and comfortable with using your computer for such tasks as accessing the internet, word-processing and installing software from a CD-ROM.

You should also have some knowledge of basic programming concepts such as sequence, selection, iteration and data types, and should be familiar with the use of assignment statements and variables. (This could be gained by study of the Level 1 course M150, for example.)

Skills

This is a Level 2 course and therefore you are expected to be able to work as an independent learner. In particular, you should have already developed some appropriate study skills, such as organising your own time, effective reading of materials and writing clear answers to assignments.

You are also expected to have sufficient arithmetic skills to use a simple calculator, and to be able to add, multiply, subtract and divide whole numbers and numbers with decimal points. The course does not require you to understand any mathematics beyond this basic arithmetic, though it does require you to develop skills involving logical and structured reasoning.

Computing facilities

It is essential that you have the necessary computing equipment and specified software installed before you start the course. In particular, ensure that you have:

- access to a computer that meets the minimum specification for the course (see below);
- obtained access to the internet by subscribing to an internet service provider (ISP);
- an appropriate browser (such as Internet Explorer) to access sites on the World Wide Web;
- word-processing software for completing your assignments that produces output readable by Word 97;
- installed the supplied software as explained in the *Software Guide*.

You can find the current computer specification via the OU website http://www.open.ac.uk: search for M255, then look at the page called Personal Computing for OU study – M255.

You will not need a floppy-disk drive.

OU network services

In order to study M255 you will need to have access to the course website, the OU's FirstClass conferencing facility, and the electronic TMA system. You will be able to access all of these services from your own StudentHome page.

You can access your StudentHome page at http://www.open.ac.uk/students/.

You will need to refer to your registration letter for your OU username (OUCU) and password. If you have mislaid your letter, you will find details of who to contact for help by clicking the link below Forgotten your password?

On your StudentHome page there will be a link to the M255 course website which will take you to the first page. All pages will have a menu of links to the Assignments & Specimen Exam Paper, the Course Units, the Software & Software Guide, etc. to help you navigate easily around the site.

It is worth exploring the site at an early stage so that you become familiar with the layout and the type of information available.

3 What the course is about

As the title of the course suggests, the [illegible] on object-oriented programming, writing software from an object-[illegible]. Object-oriented programming is concerned with constructing [illegible] units of software [illegible]. One object knows nothing of how another works, but objects can interact (to form a program) by sending [illegible] the most powerful aspects of object-oriented program[illegible] and interchanged between programs, so increasing programming productivity.

The programming [illegible] not to teach you the minutiae of the Java language, but rather to teach you fundamental object-oriented programming [illegible] oriented language. Hence, [illegible] of program code, we shall be [illegible] that best demonstrate object-oriented principles and good practice.

Aims

The course aims to provide you with an understanding of the fundamental [illegible] involved in object-oriented programming (object, class, protocol, hierarchy, inheritance, encapsulation, polymorphism and collaboration).

The blocks

Block 1 (*Units 1–4*) provides an introduction to the course and to some fundamental ideas of object-[illegible] gained from other courses or experience, and use it to understand and write simple object-oriented code. You will be introduced to basic object-oriented concepts such as attribute, state, protocol, class and subclass – initially through interaction with game-like microworlds. However, by the end of the block you will be able to extend existing classes by [illegible] your code [illegible] programming [illegible] integrated into the BlueJ IDE and specifically designed to enable you to write and test snippets of Java code in a quick and convenient way.

Block 2 (*Units 5–8*) continues the teaching of fundamental object-oriented ideas, using the BlueJ IDE and the OUWorkspace to investigate inheritance hierarchies, overriding abstract classes, interfaces, polymorphism, reuse of code, static methods and variables. Along the way you will learn about creating your own classes, and find out more about the facilities and library classes provided by Java. You will learn about different kinds of errors and also about debugging using the IDE provided. You will begin to understand more about the need to design code, and will learn to implement a class according to a specification.

Block 3 (*Units 9–11*) introduces the concept of collections (objects that store other objects) and related issues. You will be guided in applying the knowledge gained in the previous two blocks, along with the new classes introduced in this block, to carry out increasingly complex programming exercises. In particular, you will learn about the importance of reuse and how to select an appropriate collection class from Java's Collections Framework.

Block 4 (*Units 12–14*) starts by discussing how to get information into a Java program from an external source (such as a file) and how to write information to an external source, so enabling Java programs to communicate with the wider world. These ideas are further developed by discussing how an object can be saved to file from a running program and later retrieved back into the program. The other new topic in this block is testing code in an object-oriented context. You will put the ideas of testing into practice using a testing framework built into BlueJ called JUnit. Finally, the block consolidates your learning by placing programming within the wider context of the software development process.

The course software

You will be provided with a Java 1.5 development kit and a Java IDE (BlueJ) on CD-ROM. You will need to install these on your computer before you can commence studying the course. At various points in the units there will be practical activities for you to carry out in order to consolidate your understanding of the material. Some of the files you will need for practical activities will be supplied on CD-ROM, and you may need to download others from the course website.

The instructions for installing the course software are included in the CD-ROM packaging.

You will also need to install StarOffice 7 from the Online Applications CD-ROM before studying *Unit 1*.

It is normal for OU course texts to position an icon (such as the keyboard icon shown here) in the margin alongside activities that require the use of materials other than the course text. However, since *all* activities on this course require the use of a computer we have decided, on M255, that marginal icons are unnecessary.

4 Getting started

One of your first tasks will be to [illegible] a copy of the *Study Calendar* from the course website.

The *Study Calendar* will guide [illegible] course. It will help you pace your studies by showing you when you should be studying each unit of the course and when you need to submit each assignment [illegible] assessment. You might want to keep a copy of the calendar to hand so that you can keep track of your progress.

Your Regional Centre [illegible] You may find it helpful to make a note of the dates on your calendar. You can use the Tutorial Finder (accessible [illegible] regions.

The assignments for M255 [illegible] need to submit the assignments using the electronic TMA (eTMA) system. Your marked assignments will also be returned [illegible] eTMA system. [illegible] information on the eTMA system in the booklet *Using the Electronic TMA System: A Guide to eTMAs for Students*, which is included with your course mailing.

In order to access the course website, you need to have a suitable browser installed on your computer. For M255 we recommend that you use Internet Explorer (IE). If you do not have IE, you can install it from the Online Applications CD supplied with your course materials.

5 Studying the units

Throughout each unit you will find

- **self-assessment questions (SAQs)** which you can use to test how well you have understood the material studied so far,
- **exercises** which will help you to reinforce your learning as you study the unit, by encouraging you to think about the answers to questions and problems,
- **practical activities** which give you the opportunity to apply what you have just read and which will require the use of your computer and the course software.

At the end of each unit there is a list of learning outcomes that you should have achieved by studying the unit.

6 Tuition

Your Regional Centre will let you know who your tutor is, and provide details of tuition arrangements and any tutorials you can attend.

Computer conferencing

At the start of the course you will be given access to an electronic conference system, FirstClass conferencing system. These will provide a Regional Tutorial Conference that can be used to discuss academic issues with many of your fellow students supported by one or more tutors. You will also have access to a tutor group conference which is accessible only to your tutor and the students that he/she has been allocated.

You should note that the course team does not usually access these conferences, therefore you cannot contact them via your conference. Messages from the course team and any course materials will be available on the course website. For details on how to contact the course team, please see Section 9 of this guide.

7 Assessment

Part of your study of the course will require you to undertake assessment. This assessment involves the following components:

- tutor-marked assignments (TMAs),
- an end-of-course examination.

The tutor-marked assignments require you to submit the answers to a series of questions. A[illegible] with the opportunity to [illegible] tutor by certain dates, known as cut-off dates, as shown on each TMA itself and on the *Study Calendar* for the current presentation. If you experience an unexpected interruption to your study, which prevents you from submitting a TMA on time, you must contact your tutor in advance [illegible] be accepted for marking late. TMAs are to be submitted and marked electronically. For more information on this, consult *Using the Electronic TMA System: A Guide to eTMAs for Students*. Try to submit your TMA to the eTMA system well before the cut-off date, to avoid any last-minute problems such as overloading the system.

The examination will consist of short-answer questions and a choice of long answer questions. You will not be permitted to take any notes or units into the examination with you, but you will be able to take your printed copy of the *Software Guide* (with no annotations). The examination will cover broadly all the material of the course. (We [illegible] for optional study, but these will not be assessed. Optional study will be clearly identified.) You will be sent details of the location, time and date of the examination at a later date. A *Specimen Examination Paper* with solutions is included with the course materials; this will aid you in understanding what is expected of you in the examination.

Your final grade for the course is determined on the basis of your continuous assessment (TMA) [illegible] apply to one TMA out of the four on this course.

You can find out more about how your final grade is calculated from the *Assessment Handbook*.

8 Credits and qualifications

Links to other programmes

M255 is linked to several systems of credit

- **CATS points** [illegible] System that operates in British universities. When you pass this course you will have 30 CATS points. You can then build up more CATS points by studying further OU courses, or by negotiation you can take your points with you to another university. You need 360 CATS points for an honours degree.
- **OU degree in Computing** The [illegible] Computing degree. M255 is a mandatory course for this degree and also for a number of other named degrees.

Continuing to study computing

After M255, there are many other computing courses that you can take. These may further your understanding of Java or broaden your understanding of the area of analysis and design of programs (particularly of commercial size systems). We would advise you to look at the Open University website, which will guide you through the courses on offer. Alternatively, contact your Regional Centre for advice on course choice.

9 Getting help

There are many options available to you for obtaining help during your studies. For academic queries your first point of contact is your tutor, who will advise you at the start of the course how long it will usually take to respond to queries.

For course-related administrative problems you should contact the M255 course manager. You can send emails to the Student Enquiry mailbox within FirstClass, *or* write to

M255 Course Manager
Faculty of Mathematics and Computing
The Open University
Walton Hall
Milton Keynes
MK7 6AA

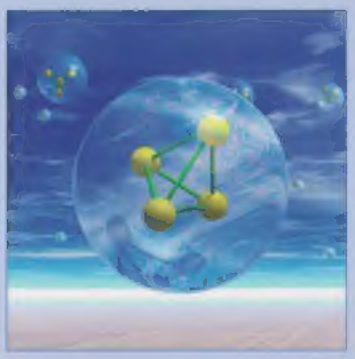
or telephone 01908 658211 (courses office) or 01908 653243 (answer phone).

You should normally receive a reply within ten working days. We do not recommend that you contact individual members of the course team directly, as they may be unavailable. The other main sources of help are listed in the *Course News* included with your course mailing, and on the M255 website.

When you have read this guide, you should refer to the *Software Guide* for information on installing the necessary software you will need for the course, and work through the practical activities before moving on to *Unit 1* of the course.

The main sources of help are summarised below. Telephone numbers are available on the website.

Nature of query	Who to contact
Academic queries	Course tutor
Tutorial support	Regional Centre
Course-related administrative problems	Course manager
Course software problems	OU Computing Helpdesk
Electronic TMAs	OU Computing Helpdesk
Mailings	Despatch Services



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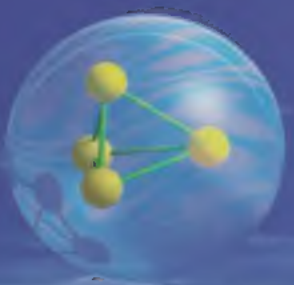

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